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U. S. DEPARTMENT OF AGRICULTURE.

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FARMERS' BULLETIN No. 150.

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# CLEARING NEW LAND.

BY

FRANKLIN WILLIAMS, Jr.,

*Farmer and Horticulturist,*

FAIRFAX COUNTY, VA.



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# LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,  
DIVISION OF PUBLICATIONS,  
*Washington, D. C., March 29, 1902.*

SIR: I herewith transmit, with the recommendation that it be published as Farmers' Bulletin No. 150, a paper on Clearing New Land, by Mr. Franklin Williams, jr., a farmer and horticulturist of considerable experience. Acknowledgments are due to Mr. G. B. Sudworth, Dendrologist of the Bureau of Forestry, who revised those portions of the bulletin relating to the characteristics of the various species of trees, and to Mr. W. A. Taylor, field expert of the Division of Pomology, for some practical suggestions.

The bulletin is especially adapted to the Middle and Southern States, where the problems it seeks to solve are frequently presented.

Very respectfully,

GEO. WM. HILL, *Editor.*

HON. JAMES WILSON,  
*Secretary of Agriculture.*

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# CLEARING NEW LAND.

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## INTRODUCTORY.

The clearing of new land is an important factor in the agricultural economics of many farms, yet probably no feature of farm life is so little understood and so blindly pursued. This unfortunate condition is largely due to lack of information upon the subject. Almost every other field of farm operations has been more or less thoroughly covered by agricultural publications of one kind or another; but the writer has long looked in vain for any definite and authentic information upon the subject of clearing land. The suggestions contained in this bulletin, being the results of practical work carried on for years, will, it is hoped, be of service to those who have land to clear.

For years the writer has been constantly engaged in clearing land, usually covered with bushes and timber of various sizes, including most species of forest trees common to the Middle Atlantic States. The task has been slow, laborious, and expensive, but very necessary.

## LARGE PROPORTION OF UNCLEARED LAND.

The conditions indicated prevail upon thousands of American farms in the earlier settled portions of the country. Especially is this true in the South, where large areas once devoted to the cultivation of cotton and tobacco have through changed conditions inevitably gone to bush and small timber. The middle West is the only section of the country that does not need the woodman's ax and mattock. There woodland lots are at a premium. True they have their heavy prairie sod to bring under subjection, but that does not compare with the task of making a way for the plow through brush and roots. The far West, however, has its share of bush land. The clearing of such tracts in that section has long been a regular occupation of Chinamen, who usually charge \$18 or \$20 per acre for such labor. New Englanders are not only annoyed by stones, but are frequently beset with scrub timber and old overgrown fields, yet it is in the South that the largest proportion of waste land is found. It is here that large farms with many wooded acres and only small parcels of cultivated land are seen. Throughout the South the proportion of bush and scrub timber land is astonishingly and deplorably large.

## IMPORTANCE OF CLEARING LAND.

Land of this bushy character is neither tillable nor suitable for timber purposes. It is an eyesore to the community and an expense to the owner. It has no earning capacity. It is deadheading its way, and the way leads only to the impoverishment of the owner. If there is no intention of improving such land it would be wise to dispose of it. Holding it for higher prices is invariably a losing game. Taxes and loss of interest on purchase money usually more than offset any increase in value.

There is a notion which obtains among many persons that the ownership of land imparts respectability. The correctness of this idea is conditional. The possession of broad and productive acres, it is true, gives prestige as well as profit, but the ownership of nonproductive bushy land is discreditable. The character and thrift of the farmer may be justly estimated by the appearance of his land.

A good plan for the owner of unimproved land is to sell the surplus. Such a course will not only promote the owner's interest, but the common wealth of the community. "Loafer" land not only represents idle and taxable capital for the landlord, but the withholding of possible support from others.

If he is a benefactor of mankind who succeeds in making two blades of grass grow where only one grew before, how much more beneficent is the mission of making grass grow where only bushes were wont to thrive.

## WHAT LAND SHOULD BE CLEARED?

The problem is not only how to clear overgrown land, but whether it will be profitable to do so. Manifestly much wooded land had better be left for timber and fuel purposes. Quantities of promising young timber are annually slaughtered. Indeed, the desecration of our forests amounts to almost a national calamity. Every farm should have its timbered tract, and that tract should be wisely conserved. The reckless use of an ax for a few hours will inflict damage that it will take nature years to repair.

**Disposition of farm lands.**—No field operation affords more opportunities for the exercise of intelligent discretion than farming, and no problem of farm life is more far-reaching in effects than the wise disposition of farm lands. To cut away young growth which would within reasonable time possess timber value is usually a mistake. To leave bush land idle when it will require a hundred years for it to develop into profitable timber is folly.

The timber consideration is not the only one that enters into the advisability of clearing land. The location of the tract, together with the density and size of the wooded covering, must be considered. The

purpose for which the land is adapted and the probable income to be derived from it when cleared generally govern the advisability of clearing it. Yet it is desirable to open up the home site, connect fields, etc., at an expense greater than any probable pecuniary return would warrant. Farming has its æsthetic as well as its material consideration. The farmer who stops to figure whether an overgrown fence row would yield enough harvest to pay for its clearing will never have an attractive farm, or extract from farm life the pleasure it is capable of affording.

**For trucking or orcharding.**—It is obvious that it may be found profitable to clear land for trucking or orcharding when it would not be profitable to do so for general farm crops. In the former case a return of \$100 or more per acre may reasonably be expected, while the gross income from an acre of grass or grain will rarely exceed \$15 or \$20.

### COST OF CLEARING.

In many sections farm improvements can be bought for less than cost. Certainly in such cases it is cheaper to purchase improved land than to buy impoverished or wooded tracts with a view to their improvement by clearing. If a living has to be earned upon it, poor or foul land is dear as a gift. Generally the expense of clearing will exceed the original cost of the land. The cost per acre will vary from \$5 or \$10, to \$30 or \$40, conditional upon kind, density and size of wooded covering. In many localities there is a fair demand for wood, the proceeds of which will help to defray the cost of clearing. In fact it might be profitable in some instances to dispose of the wood to the best advantage and then to give away, if it can not be sold, the land with all its stumps and roots and purchase improved land.

**Fighting it out with the bushes.**—However, this much can be said in favor of fighting it out with the bushes on one's own land. A farmer may improve his farm gradually as time and means permit, each year adding a few acres of cleared land. This small annual expenditure of time and means will scarcely be missed in the sum total of the year's accounts, yet in a short while it will make a most creditable showing. To thus gradually improve the land, is within the reach of all. And then there is a certain sentimental satisfaction in working out the salvation of one's own place. For who would not rather improve his own wooded hills and swampy bottoms than exchange them for the fields of another. The love of one's native place is happily a virtue that most men possess.

If for any reason it is decided to clear land, then the method to be employed becomes all important.

## METHODS OF CLEARING.

**Pasturing.**—In adopting a method of clearing one must be governed by various circumstances. For instance, if the wooded tract is adapted to pasture and stock are available, pasturing would undoubtedly be the cheapest means. If the timber consists of kinds that rot readily, it would be wise to simply cut away the wood and leave stumps and roots to decay for several years before attempting to cultivate. If the wooded growth is small, the mattock will usually prove the most satisfactory and expeditious means of removing the brush. Thus not only the location but the size and kind of timber enter into the problem of determining the wisest means for its destruction.

**Nature of ground to be considered.**—The nature of the soil is the next thing to be considered. For instance, if soft or marshy, the use of heavy machinery would be impracticable, and if stones are thickly embedded in it great difficulty would be experienced in keeping mattocks sharp. Whether the land is desired for immediate cultivation and a good yield is expected the first year or not, are also matters for consideration. It is evident that the wisest method to be pursued depends upon local conditions.

### CLEARING BY PASTURING.

When circumstances permit, pasturing is undoubtedly the most economical way of clearing land. In fact, if the growth is large and the clearing is to be a profitable investment, pasturing is probably the best method that can be pursued.

The purpose of this method is to change the field from woodland to pasture and from pasture to cultivated ground. The stock will keep down new growth while stumps and roots decay.

**Timber should be cut low.**—In pursuing this course the timber should be cut low, leaving the stumps in the most favorable condition for rotting. The bush and trash should be burned. The stock ought to be allowed the run of only so large a tract as they can keep pretty well subdued. The quantity of sprouts and young bushes an animal will nip off will depend upon whether or not it has access to other vegetable matter.

It is desirable in late summer to go over the pasture lot and with an old ax remove the sprouts and bushes which the stock have failed to subdue. If this method is carefully followed for a few years, surprising results will follow. When the stumps of one tract are dead and decaying, another lot should be added to the pasture.

Sheep and goats are preferable, but any kind of stock is suitable for this kind of pasturing. Horses and cattle, and even hogs, will answer well for this purpose.

**The Angora goat as a land clearer.**—Recently the Angora goat has attracted considerable attention as a land clearer. While other animals upon new land will usually confine their browsing to buds and tender shoots, and then largely for want of something better, the Angora prefers brush to grass. It will not only eat leaves and tender sprouts, but it will bark bushes and saplings whose tops it can not reach. This girdling is very destructive to vegetable life. In the far west, especially in the States of Washington and Oregon, this goat is frequently used as a means for clearing brush-land. Where there are large tracts to clear, goat grazing is probably the cheapest and most satisfactory method to pursue.

Those desiring further information about the Angora goat are referred to Farmers' Bulletin No. 137, U. S. Department of Agriculture, or Bulletin No. 27, Bureau of Animal Industry of that Department.

It is wiser, however, in most instances, to use what stock and means we have at hand, as the value of land in most regions is not sufficient to justify unusual expense in its improvement.

#### **CLEARING BY CUTTING AWAY TIMBER.**

It is recorded of the ostrich that when frightened it will burrow its head in the sand and imagine that it is hidden from the outside world because its own view is shut off. So it is with men who cut away and burn the brush and imagine that they have cleared the land because it looked clean. This is usually a mistake. Such land is untillable, and from each stump a number of sprouts will start and soon innumerable new bushes will be making headway. In a few years the land so recently apparently cleared will be more unsightly and expensive to clear than it was originally. Of course if it is practicable to remove immediately all starting sprouts the stumps must soon die. All vegetation requires leaves as well as roots to survive.

**Timber should be cut in late summer.**—If, however, the cutting is relied upon it is wise to do it in late summer. In clearing hardwood it will not do to cut off and wait for stumps to decay; they should be immediately removed or some method pursued that will at least keep down the sprouts and prevent objectionable plant growth.

Usually in clearing land, as in everything else, that policy is best which leaves a finished work.

**Clearing pine land.**—However, in clearing most pine land the cutting method is the most expedient. The pine genus, excepting two or three species, is happily peculiar. Contrary to the rule in forestry, when the pine is cut off just above ground it does not throw up shoots. Consequently it soon dies, and if the stump be small it rapidly decays.

Many pine lands throughout the South may be cut off and safely left idle for several years with assurance that roots and stumps will rot.



The white pine is the chief exception to this rule. Pine soil is not so impregnated with objectionable growth in an embryo state, waiting for an opportunity to develop into bushes, as is hard-wood land.

This nonsprouting characteristic of the stump of most species of pine, together with the relative freedom of pine soils from foul growth the first years, renders southern pine land comparatively easy and inexpensive to clean, especially if the timber is not large. New pine land is much more amenable to cultivation than lands from which other kinds of timber have been removed by cutting. This is owing to the semi-taproot system of the pine and the brittle nature of its roots.

**Yellow poplar.**—The yellow poplar or tulip tree (*Liriodendron tulipifera*) is another tree species which, for purposes of clearing, should be classed with the pine. The rapidity with which the stumps and roots of this tree rot, renders the cutting method of clearing land an eminently wise one in disposing of this member of the forest family. Unlike the pine, however, the poplar stump will send up numerous and vigorous shoots. Hence these should be sprouted off or grazed back, and then in a few years the stump, however large, will be a crumbled mass of vegetable mold.

There are other species of trees which resemble the pine and poplar in the susceptibility of their stumps to decay, and to which the cutting method is consequently applicable. Large areas of southern river lands have cottonwood, soft maple (red or water maple), and sycamore, all of which rot fast, though the sycamore has great vitality. But these two species—the pine and yellow poplar—sufficiently illustrate the principle, and in the destruction of these the writer has served a full apprenticeship.

**Alder.**—Before leaving the discussion of this method of clearing, it might be well to briefly advert to the alder. It is usually found in dwarf-bush size and in clusters. Its habitat is lowlands and swampy bottoms. It is master of the land upon which it thrives, and its masses of interlocked roots present an impregnable obstacle to cultivation; yet if its vulnerable points are understood it may be quickly and easily disposed off. In August cut the alders off at or below the crown, leaving the brush where it falls. The following spring, after vegetation has started and the ground is thoroughly dry, burn the area over. If the cutting and burning have been thorough, the alders will never return to plague you. The next year the ground may be cultivated with comparative ease.

#### CLEARING WITH DYNAMITE.

**Dynamite for large stumps.**—In the removal of large stumps dynamite is serviceable and economical. While it will seldom blow the stump out of the ground, it will usually split it in several parts and lay bare the roots, thus enabling the grubber to take out the stump piece by

piece, which is less laborious than removing the whole stump. When occasional stumps are scattered over the field or plantation, along the roadway, or near the buildings, their immediate removal is desirable and for this purpose dynamite is serviceable.

**Too expensive for general use.**—The cost of this explosive will not justify its use on stumps under 6 or 8 inches in diameter. It is too expensive for general use in clearing land. While it is undoubtedly the cheapest method for removing stumps of large size, it is a question whether it is advisable for general farming to clear land covered with many such stumps. The profits in such farming are not certain enough or large enough to warrant heavy expense in bringing new land under cultivation. When much of the timber is over 6 or 8 inches in diameter at base, and pasturing can not be conveniently resorted to, it is usually wise to utilize land so encumbered for its timber purposes.

The cost of dynamite will approximately vary from 10 to 20 cents

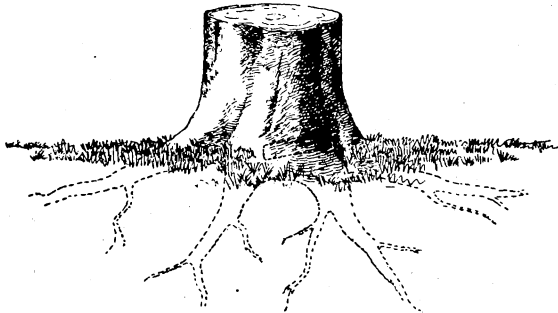


FIG. 1.—Showing dynamite cartridge in position.

per stump. It is readily seen that if there are some hundreds of these per acre the cost will be too great to justify clearing by this method land destined for general farming.

**Experienced hands should be employed.**—When using dynamite great caution must be observed, for it is very dangerous if carelessly handled. Also, if placed by inexperienced hands, much of it is likely to be misapplied. Hence, if contemplating its use, it will be safer and cheaper to employ experienced help.

As a warning to those handling this explosive, it might be well to state that dynamite consists of nitroglycerin mixed with a granular absorbent, and wherever there is nitroglycerin there is danger. It is made in different grades. These are determined according to the percentage of nitroglycerin they contain. The lower grades, those containing about 30 per cent nitroglycerin, are preferable for stump blasting because they explode with less suddenness and their tendency is more to upheave than to shatter.

Dynamite comes in cylindrical sticks of different sizes and lengths. The quantity to use in blowing out a stump depends necessarily upon

the size of the stump. The charge, with cap and fuse attached, should be placed in a hole bored for the purpose as nearly as possible under the stump. The hole should then be filled with earth and gently tamped. Then the fuse may be lighted and the operator retreat beyond the range of flying fragments.

It is generally conceded by those familiar with dynamite that the most effectual destruction of the stump is achieved by boring into it as low down as possible, thus adding considerably to the force of the explosion (see fig. 1). This method, however, adds to the time and labor and hence to the cost per stump, while the more common method of digging down by the side of the stump and hollowing out a place under it where the charge is placed will generally split up the stump sufficiently to make its removal an easy matter.

#### **CLEARING WITH MACHINERY.**

**Stump-pulling machinery.**—There are many different makes of stump-pulling machinery upon the market. The promoters of these various grubbing devices claim great merit for their respective machines, but catalogue claims should be accepted with great caution.

In the neighborhood of the writer, and doubtless in many other neighborhoods, can be found such machinery in idleness because it was tested and found wanting. The difficulty with most stump-pulling machines is that if they are strong enough for the work desired of them they are too expensive, cumbersome, and unwieldy.

When these machines are once properly adjusted, their work, provided nothing breaks, will be satisfactory. But the labor of moving and the care of adjusting, together with the liability to breakage, more than outweighs the virtues of any stump-pulling machine known to the writer. Moreover, usually, when the timber is large enough and thick enough to suggest recourse to machinery for clearing, it will not pay to clear such land at all unless it can be devoted to some specially profitable crop.

However, it may be said of machinery cleared land that the clearing is thorough. The machine removes practically all the roots of any size from the ground, leaving the land in a good tillable condition.

When it is the intention to use a machine the timber should be cut away and removed and the brush burned. Such preparatory work will greatly facilitate the moving and operation of the machine. The stumps should be left high enough to conveniently loop with a chain, for it is much easier to get a secure hold above than below ground.

**Best time to operate a machine.**—The best time to operate a machine is immediately after a heavy thaw or rain. The stumps will draw much easier when the ground is soft and loose than when it is dry and hard.

### CLEARING WITH HORSES AND CHAIN.

**Pulling up saplings.**—This method consists in pulling the young trees out of the ground. Where conditions are favorable it is surprising how rapidly this may be accomplished. Best results can be obtained where the growth consists of saplings, say 2 to 4 inches in diameter, which have a lateral root system such as possessed by the locust, maple, or dogwood. The ground should be soft and loose. The plan is simple. It consists in fastening one end of a long log chain to the trunk of the sapling as high above the ground as the flexibility of the

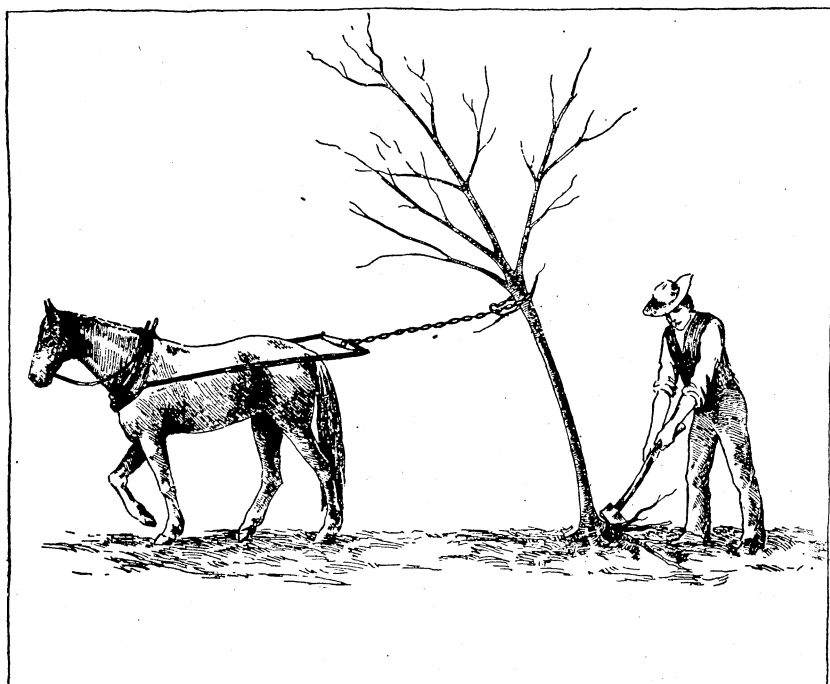


FIG. 2.—Uprooting sapling with horse and chain.

tree will permit and hitching a steady horse, or, if necessary, a team of horses (see fig. 2) to the other end of the chain. While the horses are pulling at the tree a man should be at its base with an ax and assist them by severing such roots as seem loath to give away.

**Good and fast work.**—In this manner, when the saplings are of the right size and kind, the ground in proper condition, the horses true and steady, the man with the ax alert and discreet, wonderfully good and fast work can be accomplished.

Stumps may also be pulled up with chain and horses. One end of a log chain should be fastened around one of the large roots of a stump, a team of horses being hitched to the other end. The chain is placed

across the top of the stump which acts as a fulcrum and furnishes leverage for its own removal. (See fig. 3.)

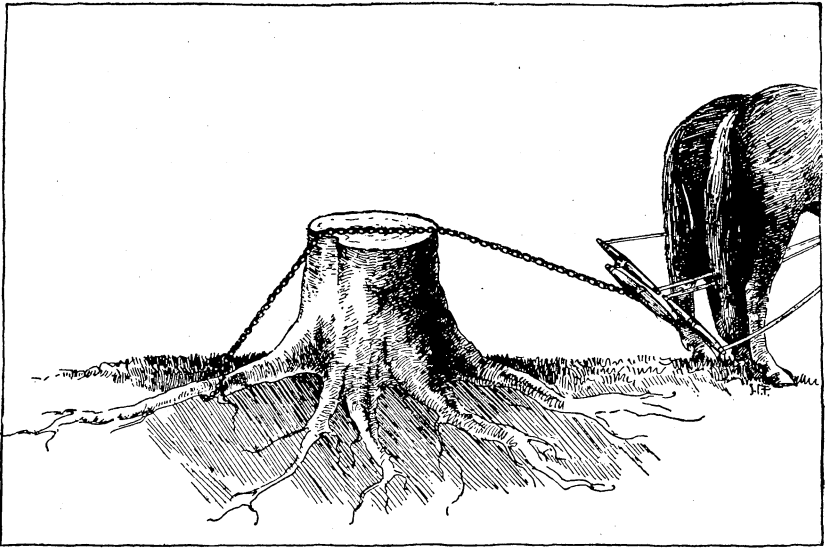


FIG. 3.—Pulling stump with chain and horses.

#### CLEARING WITH OXEN.

A method in use at the Alaska Experiment Stations is thus described by Prof. C. C. Georgeson, special agent in charge of those stations, in his annual report for 1901:

It has been our policy to gradually extend the clearing of land when time could be spared from other work. The timber is small and the task is not a difficult one, but the stumps are numerous, and it became necessary to devise some plan by which they could be pulled rapidly. The roots do not grow deep and it does not take great power to pull the average stump. A machine which was set up over the stump and worked by hand was first tried, but it proved to be too slow work, and it was too cumbersome to move. As a cheap and efficient means to aid in this work, I devised a simple stump-pulling tackle, consisting of two triple blocks and 300 hundred feet of 1-inch rope. One block is anchored to a solid stump and the other is attached to the stump it is desired to pull. When secured in this way the oxen are hitched to the rope and driven up slowly, and the stump usually comes out without trouble. The method of using this tackle is illustrated in fig. 4. Two men and a yoke of oxen pulled 6 stumps in fifty minutes while I was there. I mention this fact only to show that it is a simple and efficient machine.

The illustrations show the method of attachment when the stumps are cut high, or when they are very small. When the stumps are 12 inches in diameter, or when cut low so as to afford no leverage, we use a device of two timbers about 6 feet high, fastened together in the form of a letter A. To the top of this A is attached a chain or wire rope some 4 or 5 feet long and terminating in a hook. The A leans against one side of the stump and the hook is attached to a large root on the other side. The power is then applied to the top of the A, and as this is raised up the stump is tilted over.

The device simply affords greater leverage than when the block is secured directly to the stump, as shown in the illustration.

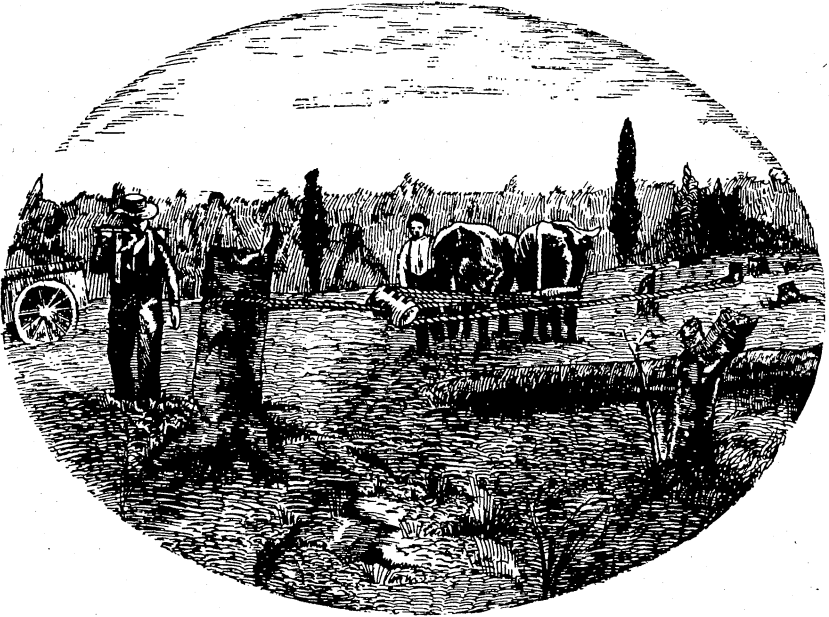


FIG. 4.—Removing stump with triple block and rope.

#### OTHER METHODS OF CLEARING.

**Clearing with mattock.**—The mattock is king of new ground tools. No other instrument is so widely or satisfactorily used for grubbing. Wherever there are bushes the farm equipage is incomplete without its quota of mattocks in good condition. This tool is the most simple and convenient of all clearing implements.

**Gradual clearing.**—In most instances economy and convenience require that clearing be done gradually, an acre or two being added each year. For such work the mattock is undoubtedly the most economical and best adapted. When a large tract is to be cleared without intermission, then other methods may be more suitable.

It is not generally advisable to cut off timber with a view to grub out the stumps afterwards. It is much easier to grub the standing timber than the stumps after the trunk and tops have been severed, for it is the tap roots that are most inaccessible and difficult to reach and cut, and the tops, by serving as a lever, greatly assist in loosening these.

**Removal by wind and rain.**—In the removal of trees of considerable size much labor may be saved by digging a trench immediately around the base of the tree, cutting all the laterals, and leaving the tap roots for the action of rain and wind. Water will collect in the trench and

soften the subsoil and the wind with its swaying force will soon throw the tree. Indeed, when the side roots and the earth have been removed from around a tree, the prying force which the top will exercise upon the remaining roots will be irresistible. Each drop of rain and each puff of wind will contribute toward loosening and breaking those tap roots, which on account of their position almost defy the mattock. The assistance which nature is capable of affording in clearing away trees is wonderful. The spring season, when the ground is loose, the rains heavy, and the winds strong, is the most opportune time to pursue the above method.

**Use sharp tools.**—If a new mattock is needed do not be too economical to purchase it, and if it is dull do not imagine that you have not time to sharpen it. With a worn or dull hoe a man will pound more life out of himself than out of the bushes. A good plan is to have two hoes for each grubber, always keeping one in good condition. For sharpening hoes there is nothing so satisfactory as a steel file 12 or 16 inches in length.

Do not attempt too much continuous grubbing. It is very laborious work, and men will soon tire of it and become discouraged. A fatigued, disheartened laborer is never a success.

**Grubbing at intervals.**—Plan to do some weeks of grubbing in the fall before winter sets in, continue it from time to time through the winter as weather permits, and follow it up in spring with a few weeks more. In this manner a good deal can be accomplished without overtaxing your men at any one time.

Grubbing is slow and expensive, but when the land is needed it is time and means well spent. No farm is well ordered where there are foul fields and overgrown fence rows. No farmer commands the esteem of his neighbors when bushes are everywhere encroaching upon him.

Bush land is yielding no income. It is a boarder, and the owner pays the board bill in the shape of taxes, while the land is depreciating because it is growing all the time more expensive to clear.

## **METHODS OF CLEARING CONDITIONED UPON CHARACTER OF GROWTH.**

**Variation of root systems.**—There is a marked variation in the root systems of different species of trees. The roots of some strike deep into the ground, while others extend out laterally; and still others traverse the ground in every direction. Some varieties are much more persistent in renewing themselves than others. The stumps of some kinds will survive for years, while those of other species will soon decay.

It is obvious that these varying characteristics of root and stump must affect the method of dealing with the different species of trees.

**Classification of trees according to root characteristics.**—In the United States there are about 500 species of indigenous forest trees. It would be beyond the limits and requirements of this article to attempt anything like a complete classification of all these numerous species. For our purpose we may classify trees according to their root characteristics and the durability of their stumps. To illustrate, we will indicate a number of a pronounced type belonging to these several classes.

#### TREES WITH A TAPROOT SYSTEM.

The hickory, black gum, and white oak will represent this system. They have a typical taproot. (See fig. 5.) Indeed, so pronounced are these characteristics that the root frequently holds its full trunk size for several feet under ground. Sometimes these large taproots break up into several smaller ones, but they invariably pursue a deep course downward. They send out to the side numerous small feeders, but exceptionally a lateral root of much size.

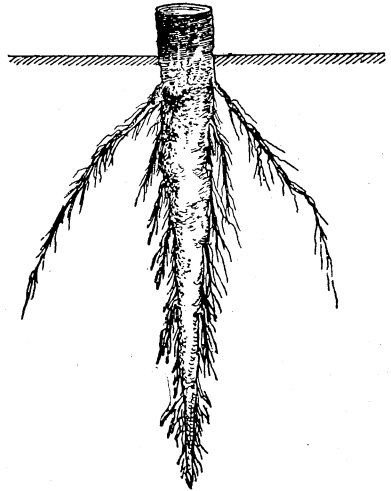


FIG. 5.—Stump with taproot.

**Cultivation around stumps.**—This is evidenced by the facility with which cultivation may be carried on around stumps having this root character. In plowing new ground the plowman is surprised to find with what ease he may pass some stumps, while it is necessary for him to bear his plow out of the ground or fight his way through a maze of roots as he approaches stumps of another species. Still further evidence of the varying root character of trees is manifested by the ability of some species to withstand wind storms, while others easily succumb. The forest may be full of uprooted trees, but the hickory, black gum, and white oak stand erect, resisting the force of wind and the ravages of time, until age has caused them to decay and crumble back to earth.

**Stumps difficult to remove.**—The taproot system of such trees makes it exceedingly difficult to remove their stumps. Roots of this character are very inaccessible to the mattock and resistant to force, whether applied by machinery or explosives. Hence, in clearing land covered with timber possessing this root system, either the method of pasturing or cutting back and cultivating should be pursued. The comparative ease with which the farmer may cultivate among stumps of this character and the extraordinary labor required to remove them, unite in suggesting the pursuance of one or the other of these methods.



### TREES WITH A SEMI-TAPROOT SYSTEM.

This system embraces that numerous class of trees which throw out their roots in every direction. (See fig. 6.) The pines, poplars, and

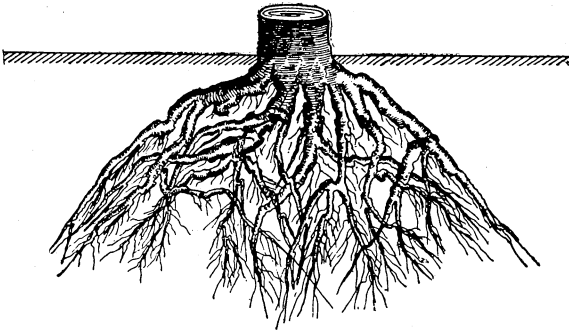


FIG. 6.—Stump with semi-taproot.

chestnuts are good specimens of this system and are widely distributed. In many sections of the Eastern States trees of this kind largely predominate upon most wooded areas. Not only does this class include the largest number of trees, but also the greatest number of species.

Stumps with a semi-taproot system are not as expensive to remove as those with the system previously described; but, on account of their surface root, plowing among them is much more difficult. However, removing stumps of this class is an unthankful and laborious task.

### TREES WITH A LATERAL ROOT SYSTEM.

The varieties of this kind are much less numerous than those of the preceding classes. It embraces all trees whose roots are of a distinct surface character. (See fig. 7.) The elms, soft maple, locust, dog-

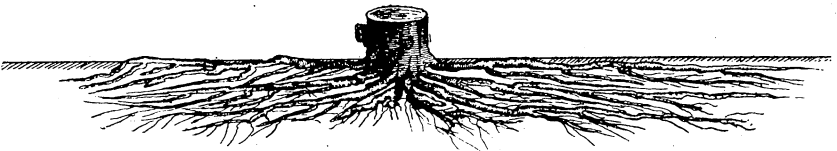


FIG. 7.—Stump with lateral roots.

wood, and alder are representatives of this class. These species do not always attain the size of trees, but their roots invariably belong to the lateral system. In fact, their roots all extend immediately upon or just under the earth's surface.

It is exceedingly difficult to plow among stumps having this lateral system of roots. Practically all their roots are within the reach and path of the plow. Happily, stumps of this class are comparatively easy to remove. Their roots are readily accessible to the mattock, or easily yield to the force of machinery or explosives.

### TREES WITH AN INDETERMINATE ROOT SYSTEM.

There are several varieties of trees not only possessing a peculiar root system, but a wonderful capacity for reproducing themselves. On account of their wide distribution, common occurrence, and annoying character it is deemed advisable to briefly advert to several leading specimens of this class.

**Sassafras.**—This is found most frequently in bush form. While it is occasionally observed growing to large size amid other forest trees, its favorite location is in old fields. Its chosen companions are hen grass, briars, and scrub pines. The growth for the first and second years is most vigorous; after that age very stunted.

The sassafras possesses a very singular root system. The roots strike perpendicularly into the ground for approximately 8 to 16 inches, then turn at right angles, rarely both ways, and pursue a horizontal course for about the same distance, when they split into numerous laterals.

Another and unfortunate peculiarity of the sassafras is the rapidity with which it reproduces itself. In this respect it resembles the asparagus vegetable. Indeed, after one has grubbed out this bush several times and observed how quickly and how numerously it reappears, he is forcibly reminded of the saying as to flies—for every one killed seven will return.

The usual custom of grubbing sassafras off several inches under ground serves only as a temporary expedient. While it will permit the plow to pass unmolested the first year, the next season and each succeeding one, the mattock will have to precede the plow.

Constant and careful plowing and cultivation, if maintained for several years, will gradually exterminate this bush; but due regard for the condition of the soil will usually not permit such treatment. The improvement of the soil also tends to subdue the sassafras. Rich land does not seem to be congenial to it. It thrives best upon poor lands that are left idle at intervals.

The most satisfactory method of dealing with sassafras, if it is large enough, is to pull it out root and branch. Any clamp device, adjusted to a strong handle 5 or 6 feet long, and in such manner as to give strong leverage, will answer. There are such implements upon the market. They are most serviceable, not only in clearing sassafras, but for all other kinds of small bushes. This device can be used only on bushes of medium size. If too small the bush will break, and if too large the clamp can not take hold or the man power at the other end will not be sufficient.

The sassafras may be exterminated by one grubbing, if the root is followed and cut beyond where it makes the turn or angle, but this method is laborious.

**Persimmon.**—This species exists in various sizes over a wide range of territory. Its frequent form is that of a small, slender sapling. Its most common habitat is lowlands and swampy bottoms. In many particulars the persimmon is like the sassafras. Their root systems are practically identical. They are similar in their propensity for sending up sprouts when grubbed off in the usual manner, just under the surface. The lower limbs of both gradually die away as higher ones are thrown out. All trees are more or less given to this self-pruning process, especially if growing in close proximity with others, but this feature is very pronounced with sassafras and persimmon. It is evidenced even by small isolated bushes of these species.

The identity of root systems and similarity of throwing up shoots of these kinds renders it highly advisable when clearing to treat both alike. The several methods suggested for the eradication of the sassafras apply with equal force to the persimmon.

There are many old fields thickly set with small specimens of these two bushes. Such infestation if not wisely treated will prove a perennial plague. If the bushes are too small to admit of pulling by a hand grubber, then the best treatment for such fields is close pasturing. In lieu of that, frequent deep plowing with a sharp plow point will suffice.

**Locust.**—This variety, in some respects, is quite similar to the preceding. Its roots are usually nearer the earth surface, more numerous, attenuated, and tenacious than those of the sassafras and persimmon, but they pursue the same curious course. Cutting the locust off at or under the surface simply adds vigor to its offspring and increases its tendency to throw off more shoots.

The locust is valuable for timber purposes, and it is evident that is the mission for which it was created. Nature has not only given it a most difficult root system to subdue, but she has fortified its tops with numerous prickly thorns.

Beware of the locust tract. Tackle anything else in preference. But if it must be cleared, arm yourself with thorn-proof gloves and clothes and use the device recommended for pulling sassafras, or the horse-and-chain method advised for drawing saplings.

#### **THE DURABILITY OR PERISHABILITY OF STUMPS.**

This feature of stumps manifestly and materially affects the problem of their removal. It is expensive to remove them, whatever method is employed, and if they are readily perishable it will be wise to leave their disposition to the processes of nature.

On the other hand, cultivation among stumps is slow and unsatisfactory, and if they are very resistant to decay it will be well to take them out.

The inclination of stumps to resist or succumb to the corroding effects of time are most striking and varying. For instance, the

stumps of the locust and cedar are almost unaffected by the waste and ravages of age. He who cuts off such timber expecting the stumps to decay will wait in vain, for he will invariably pass away while the stumps still remain firm in their native fastness.

Stumps of the chestnut and white oak, if large, will, though not so durable as the locust and cedars, easily survive for a generation. While other species of the oak genus, the yellow poplar, and most species of the pine will soon perish, the white pine is, however, very durable.

When the durability of stumps renders their removal advisable, if they are large, it is well to wait a number of years after cutting away the timber until the smaller roots have rotted, when the stumps may be removed with much less labor. Meanwhile the land should be pastured or cultivated to keep down foul vegetation.

### **A PRACTICAL ILLUSTRATION IN CLEARING LAND.**

In view of the various methods above referred to in clearing land and of the varying conditions of the land to be cleared, it may be helpful to the reader to take a certain lot and describe from the beginning the clearing process to be pursued. In presenting such a practical illustration, however, we will not discuss the method referred to and sufficiently described under the heading of "Clearing by pasturing." That method is, when time and circumstances permit, one to be highly commended, but it presents fewer difficulties than other methods, and hence the present illustration will deal with the other methods.

We will suppose a 5-acre lot covered with a variety of wooded growth, as is usually the case, including white and black oak, chestnut, hickory, poplar, pine, and dogwood, varying in size from the small sapling to medium-sized trees, and the whole covered with more or less, perhaps considerable, underbrush. We will assume that the owner of this lot desires to use this land as soon as possible, and that, after due consideration of its soil and location, character of the growth covering it, and the probable cost of clearing the same, he decides that it will pay him to do so for the purpose he has in view.

The first step, regardless of what subsequent methods he may pursue, will be to select a dry time, probably in middle or late summer, to fire the underbrush and thoroughly burn over the lot. A good burning at this season will clear much of the small growth and consume the litter, both of which will be of considerable assistance in future treatment, whatever that may be.

Now, were the character of the growth on this lot fairly uniform as to the age and kind of timber, the undergrowth being burned away, a uniform method of clearing could be adopted to remove the timber still standing, but, as we have said, the growth varies in size from the small sapling to the medium-sized tree. The character of the timber

includes more or less of the kinds and varieties referred to above under the head of taproot, indeterminate root, and lateral root systems. Consequently it will be necessary for the owner to resort to more than one means to effect a complete clearing of this land. After what has already been said with reference to the matter, it is obvious that the mattock and the ax must be provided and considerable dependence placed on these tools. The first thing to be undertaken should be to cut down those trees of a sufficiently large growth to make serviceable timber for firewood or other purposes, whose stumps may be allowed to remain in the ground, either because of their tendency to quickly rot and decay or because of their deep taproots, making the removal of the stump difficult and costly, bearing in mind also that the taprooted stumps offer comparatively little obstruction to the plow. In the case of trees of medium growth, of which, owing to the nature of their roots, the stumps must be removed, it will be well to dig down around the base, making a trench, as it were, around the tree, severing with an ax all roots extending laterally from the stump; if these remained unsevered they would serve to keep the tree upright. The trees thus treated will, for the most part, succumb to winds and storms, pulling up the stumps with them as they fall.

The next process will be to tackle the young saplings, as previously described, by means of a chain and team, pulling them out of the ground, stumps and all. Attention is called to the fact that where the stump has to be removed by pulling, whether in the way just described or by the stump puller, it is important to select for the purpose a day succeeding a wet spell or a thaw, when the earth is soft and wet for a considerable depth below the surface, a condition which will greatly facilitate the operation of stump pulling. As the work progresses it may be necessary from time to time to again resort to firing, burning worthless timber and litter, the timber designed for lumber or fuel having been previously removed and piled for future use.

At this time we have our lot pretty well cleared of standing timber, save such as has been left for the influence of wind and weather, and work must now be undertaken on such stumps as it has been found expedient to leave in the ground up to this time, but which from their position or nature it will be necessary to remove before undertaking to plow the land. In these cases the method indicated in fig. 3 may be adopted, or the stump puller, if available, may be called into service. Possibly in a few cases, probably exceptional on this lot, recourse may have to be had to dynamite. Toward the spring those trees which have been dug around and which have succumbed to winter storms will in their turn have to be removed. By pursuing systematically the course above set forth on a lot of the character indicated, the owner will doubtless have it in proper condition for the plow by the spring following the year in which he began the clearing.

### CULTIVATION OF NEW LAND.

The quantity of roots remaining in the ground after it has been cleared is always surprising. No matter what clearing method has been pursued or how carefully it has been done, the plow will discover an aggravatingly large number of roots. When stumps are pulled out by machinery many more roots are removed than by any other method. But even in machinery-cleared land the ground will still be full of roots, mostly small, it is true.

In plowing new land a good, steady, strong span of horses is of the first importance. Horses that are fast or fractious will not answer. They will fret the plowman, break the plow, and bruise their shoulders. With a spirited team, even though nothing is broken or injured, it is hard to do good work. If the plow is drawn rapidly it is quite impossible to guide it closely and avoid stumps and roots.

After the winter season of comparative idleness horses should not be put to plowing new land. Their shoulders have grown tender from disuse and should be first gradually toughened in old land; moreover, some of their accumulated energy should thus be worked off.

**Oxen preferable to horses.**—For plowing new ground oxen are preferable to horses. They are steadier and stronger. Formerly in breaking new land it was a common occurrence to see several yoke of oxen attached to one strong plow; and they did yeoman service. Now, in this age of hurry and rush, the slow, plodding ox has been forced to give way to the faster horse, and when new ground is to be plowed unfortunately the ox is seldom at hand.

There are several patterns of plows made especially for new-ground work. These grub plows, however, while strong and handy, are not essential. Any standard plow with a good cutter properly and securely adjusted will do good work.

**Cut roots that stop the plow.**—When plowing new land always have a mattock conveniently fastened to the plow handles, and cut all roots that do not break. When the plow becomes "hung" in roots it is better to cut it loose than to back and pull out. The root that stops the plow will interfere with cultivation, and the same root, unless severed, will occasion this annoyance for several successive seasons. In plowing new land it is well "to make haste slowly." Leave no skips. Turn a continuous furrow. The time saved in cultivating the crop, together with the increased harvest, will more than pay for the pains taken.

The second season the plow furrows should be run at right angles to those of the first. If these two plowings are thoroughly done, the ground will be completely broken and subdued.

If the land is very stumpy it will be quite difficult to level down for planting purposes. When the stumps are too thick for the old-fashioned A harrow to be used a heavy brush or cultivator, run opposite

to the way the land was plowed, will answer fairly well. When the land is not too stumpy or the stumps are cut very low the spring-tooth harrow will do excellent work. The teeth will bound over stumps and roots that are fast and comb out a great many that are loose or broken. If the roots are plentiful, and they usually are, many of them will have to be removed. With an improved adjustable spring-tooth harrow, many of the loose roots may be combed out and windrowed and then burned or hauled off.

**New land should be cultivated for successive seasons.**—In bringing new land under cultivation, cultivate for several successive seasons or until all roots are thoroughly broken and all foul vegetation completely destroyed. If cultivated for only one year and then seeded down or left idle any number of roots and small bushes will revive and start into renewed life.

### CROPS ADAPTED TO NEW LAND.

New land, because of the large quantity of vegetable matter it contains, is exceedingly loose. The leaf mold also gives the soil a dark color and fertile appearance. Humus or decomposed vegetation is an essential element in productive soils. It imparts a wholesome physical character and furnishes properties that enable it to retain heat, moisture, and plant food. But soils may contain too much organic matter, especially if it is not well decayed, hence virgin soil is usually not sufficiently productive at first for best crop results. Ordinarily, however, on new ground in the South each succeeding harvest will exceed the preceding one until the third or fourth year is reached. So that, in the long run, this excess of vegetable trash on recently cleared woodland tracts will, by its fertilizing value, and adding humus to the soil, more than compensate for the immediate loss in the earlier years.

**Corn is a good crop for new land.**—New land is so aerated that usually crops growing on it suffer much for lack of moisture. It will generally produce a good growth of stalk, but the yield of grain will be poor. This is especially true of corn. If not overtaken by a severe drought the fodder will likely grow to good size, while the ears will be small and faulty. Corn, however, is a good crop for new land, not that it is especially adapted to such land, but because it is the easiest of all crops to cultivate on rough and rooty soil. The cultivation that corn requires is the very kind most desirable for new land. After several corn crops have been removed the land should be in good condition for any grass, cereal, or vegetable.

Oats should not follow corn on new land, or for that matter should not be seeded to any foul land, for they, especially spring oats, are the foulest crop upon the farm. The early spring preparation of the ground required for sowing oats serves as an excellent inducement to

the vigorous growth of weeds, briars, and bushes; and the inability to cultivate oats during the growing season will enable this foreign matter to again secure a foothold.

**Clover well adapted to new land.**—Among the grasses, clover seems best adapted to new land. Indeed, upon such soil it will invariably thrive, while upon old neighboring fields it may be difficult or impossible to secure a stand. In seeding new land to clover select the largest and most vigorous variety. The denser the growth the more difficult it will be for foul matter to secure a lodging; and the higher the clover stands the more shade it will afford, and this will facilitate the decay of roots and stumps. In fact, a most excellent treatment for new-ground pine land is to stir the surface with a harrow or cultivator and seed it to the large sapling clover. The clover will serve a most useful twofold mission. It will add nitrogen and humus to the soil and greatly assist in rotting the roots and stumps by the shade and contiguous decaying matter it affords.

Fruits of all kinds do well upon cleared woodland, provided, of course, that the location and mechanical condition of the soil are suitable. But it is not wise to plant trees on such land until it has been thoroughly plowed and is in a condition to be conveniently cultivated. In planting an orchard upon stumpy land, stumps should not be allowed to remain in proximity to the newly set trees. The stumps will not only interfere with cultivation but greatly endanger the trees by bruises from horse or plow.

**Strawberries make a satisfactory growth.**—Among small fruits the strawberry thrives especially well on recently cleared land. Upon such soil it makes a most satisfactory growth and fruitage, and much less labor is required to keep the weeds and grass down, as the ground is not impregnated with foul seed. This immunity of new ground, compared to old land, from weed and grass infestation is a most important factor not only in strawberry culture but in all gardening or trucking operations.

**New ground is desirable for trucking.**—For vegetable growing new land is very desirable, not only because of its comparative freedom from foul growth, but because such soils contain a large supply of organic nitrogen, the most necessary and expensive of vegetable fertilizers. It is light and porous, thereby enabling the tender sprout after germination to more readily push its feeble form through the earth's surface. Upon old land frequently a crust will form on the surface or the soil become baked, thereby preventing seed from coming up, but no trouble of this character is experienced with new ground. The physical condition of such soils greatly encourages the development of those tuberous vegetables that grow by a process of expansion under ground.

These are some of the properties of new ground that render it desir-



able for trucking. Potatoes, both sweet and Irish, will certainly thrive on this soil. They will yield well, be symmetrical in form, clear in color, and very free from scab. The tomato is another vegetable most congenial to new ground; upon such land it is relatively free from blight and less liable to be choked or smothered by a late summer grass, which so frequently appears upon old land after the size of the vines prevents cultivation. Neither should tobacco be omitted in enumerating crops adapted to new land.

Indeed, there is no question about the profitable cultivation of new land. The problem is when and how to clear it. When once the clearing has been completely accomplished the yield from such lands will be more satisfactory than the harvest from old fields. In fact, in many instances it would be wise and economical for the farmer to plant his old worn and washed fields to forest and clear other land for cultivation.

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